

## MEMORY

## INTRODUCTION

Having enough memory in your PC is vital. No matter how fast your processor is, it will slow to a crawl if you don't have enough RAM. When Windows runs out of memory it is forced to keep reading and writing data to your hard disk, slowing down everything considerably.

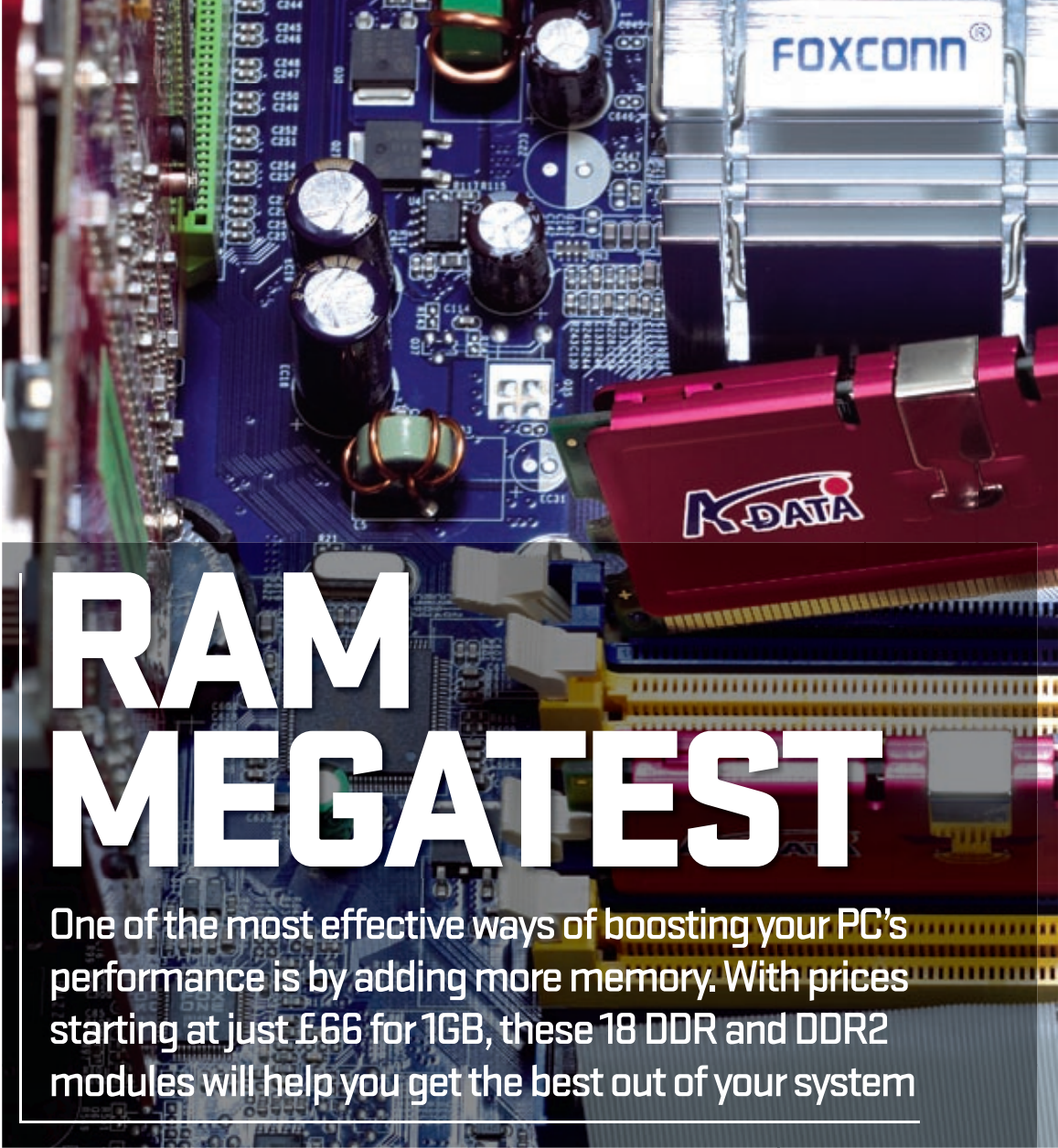
Unfortunately, upgrading memory isn't as simple as just picking up a 256MB, 512MB or 1GB module and plugging it in. Memory comes in several types and many speeds, and fitting slow memory can hamper your computer's performance. If you want to get the most out of your computer by overclocking, you'll need to choose especially carefully to find memory that can run at very high speeds.

This month we've tested 18 different memory modules. We'll show you which DDR and DDR2 RAM is the best value for money, and which will give you great overclocking results. Whether you are building a new PC or you are upgrading your existing system, we'll help you find the perfect pair of memory modules.

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# RAM MEGATEST

One of the most effective ways of boosting your PC's performance is by adding more memory. With prices starting at just £66 for 1GB, these 18 DDR and DDR2 modules will help you get the best out of your system

## Choosing... Memory

**C**hoosing the right memory for your PC can seem daunting. The situation isn't helped by some fairly confusing product names and the huge amount of technical information available for every memory module. Fortunately, things aren't as confusing as they first appear. This guide will make sure you get the right memory for your PC and your pocket.

### CALLING THE SLOTS

There are two types of memory commonly used in modern PCs: DDR and DDR2. The first step is to work out what type your computer requires. The best way to do this is to check your computer or motherboard manual. If you don't have a paper manual for your motherboard, it's almost certainly available online. Find the name of the motherboard, which should be printed on it, and enter this into Google. This should find the manufacturer's website, where you can download a manual as a PDF file.

You should also check whether or not your motherboard has dual-channel memory. Most modern motherboards do, allowing them to run slightly faster if you fit memory in matching pairs of two modules. If yours doesn't, fitting a single 1GB module will be no slower than fitting two matching 512MB ones.

Almost all the modules we've tested in this article are sold in matched pairs.

### CLOCKING IN

Once you've identified the type of memory you need, you have to work out which speed to buy. Memory modules are rated according to the maximum speed at which they can run. This sounds simple, but annoyingly there are two common ways to express the speed of any one type of memory.

The first method is to quote the type of memory, followed by its rated speed in megahertz. DDR RAM that runs at 400MHz is called DDR-400, and DDR2 that runs at 800MHz is called DDR2-800. The other method quotes the memory's maximum transfer rate in megabytes per second. This number is preceded by PC, for DDR RAM, or PC2 for DDR2 RAM. Using this notation DDR-400 memory becomes PC 3200 and DDR2-800 is known as PC2 6400.

If you're building a new computer, the speed of memory you need to use depends on your processor and the motherboard you're fitting it in. Our Labs test of processors (*Shopper* December 2006) lists the fastest memory supported by all the latest Intel and AMD processors. You should use this memory where possible,





and fit the processor in a motherboard that supports memory running at this speed.

If you're upgrading your computer and you don't want to overclock it, the simplest way to work out the correct speed of memory is to see what speed is already fitted. Most memory modules have their speed printed on a label.

Alternatively, you could download a diagnostic utility such as CPU-Z. Bear in mind, though, that many of these utilities will report your memory speed as half its rated speed. For example, if you have DDR-400 (PC 3200) memory, it will be reported as running at 200MHz. This is because both DDR and DDR2 transfer information twice in every cycle, effectively doubling their speed. DDR-400 memory does run at 200MHz, but by performing two operations each clock cycle its speed is equivalent to 400MHz.

All modern computers with DDR memory slots use DDR-400 memory, so we've tested four sets of DDR-400 modules. DDR2 computers tend to use either DDR2-533 or DDR2-800 modules, so we've tested both types.

### TIME OUT

If you plan to overclock your PC, you'll need to buy memory that's suitable for running at higher-than-normal speeds. The basic principle behind overclocking is to raise the speed at which the processor and memory in your system run. This is achieved by slowly increasing the

clock speed settings in your motherboard's BIOS. However, if the speed is increased too far, the system will become unstable.

Not all motherboards include the options necessary for overclocking, and as processors get hotter as they run faster, you may need special cooling equipment to keep your PC running at a substantial overclock.

Most of the memory in this group will overclock to a certain extent. We attempted to overclock all the standard DDR and DDR2 memory modules, and the table on pages 98 and 99 shows how far we were able to push each one before our test computer became unstable. The best standard DDR memory modules here ran 25 per cent faster than their standard speed.

### THE HEAT IS ON

While most of the memory in this group will overclock to a certain extent, you'll get better results with overclocking memory modules. These have metal heatspreaders to keep the memory cool at high speeds, and some are rated to run at much higher speeds than are needed by a processor running at its standard top speed.

For example, several of the modules in the group run at more than 1,000MHz, a speed far faster than today's motherboards officially support. This means that you can overclock your processor some way beyond its normal speed before you hit the memory's rated performance.

## This month

### Standard DDR RAM

**CORSAIR**  
**VS1GBKIT400**  
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**CRUCIAL**  
**CT2KIT6464Z40B**  
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**ELIXIR**  
**M2Y51264DS88B1G-5T**  
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**KINGSTON**  
**KVR400X64C3AK2/1G**  
Page 98



### Standard DDR2 RAM

**AENEON**  
**AET660UD00-370A98Z**  
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**CORSAIR**  
**VS1GBKIT533D2**  
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**CRUCIAL**  
**CT2KIT6464AA53E**  
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**CRUCIAL**  
**CT2KIT6464AA80E**  
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**KINGSTON**  
**KVR533D2N4K2/1G**  
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**KINGSTON**  
**KVR800D2N5K2/1G**  
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### Overclocking DDR2 RAM

**A-DATA**  
**M20AD6G3I41701E5**  
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**CORSAIR**  
**TWIN2X1024A-6400C4**  
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**CORSAIR**  
**TWIN2X1024-8500**  
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**CRUCIAL**  
**BL2KIT6464AA804**  
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**CRUCIAL**  
**BL2KIT6464AA1005**  
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**G.SKILL**  
**F2-6400PHU2-1GBHZ**  
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**KINGSTON**  
**KHX8500D2K2/1G**  
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**KINGSTON**  
**KHX6400D2K2/1G**  
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## MEMORY

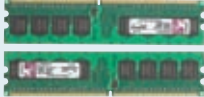
## STANDARD DDR2 RAM

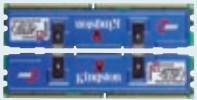
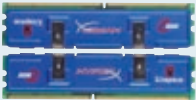
| STANDARD DDR RAM                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                                                                                                                                                                                                                                                                                                                                                                            | STANDARD DDR2 RAM     |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| BEST BUY                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                                                                                                                                                                                                                                                                                                                                                                            | BUDGET BUY            |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| MANUFACTURER                                                                                                                                                                                                                                                                                                                                                                                                      | CORSAIR         | CRUCIAL                                                                                                                                                                                                                                                                                                                                                                    | ELIXIR                | KINGSTON                                                                                                                                                                                                                                                                                                                                                                                                   | AENEON              |
| Model                                                                                                                                                                                                                                                                                                                                                                                                             | VS1GBKIT400     | CT2KIT6464Z40B                                                                                                                                                                                                                                                                                                                                                             | M2Y51264DS88 B1G-5T   | KVR400X64C3 AK2/1G                                                                                                                                                                                                                                                                                                                                                                                         | AET660UD00-370A98Z  |
| Rating                                                                                                                                                                                                                                                                                                                                                                                                            | ★★★             | ★★★★★                                                                                                                                                                                                                                                                                                                                                                      | ★★                    | ★★★★                                                                                                                                                                                                                                                                                                                                                                                                       | ★★★★★               |
| Module size                                                                                                                                                                                                                                                                                                                                                                                                       | 512MB           | 512MB                                                                                                                                                                                                                                                                                                                                                                      | 512MB                 | 512MB                                                                                                                                                                                                                                                                                                                                                                                                      | 512MB               |
| Rated speed                                                                                                                                                                                                                                                                                                                                                                                                       | 400MHz          | 400MHz                                                                                                                                                                                                                                                                                                                                                                     | 400MHz                | 400MHz                                                                                                                                                                                                                                                                                                                                                                                                     | 533MHz              |
| Rated bandwidth                                                                                                                                                                                                                                                                                                                                                                                                   | PC 3200         | PC 3200                                                                                                                                                                                                                                                                                                                                                                    | PC 3200               | PC 3200                                                                                                                                                                                                                                                                                                                                                                                                    | PC2 4200            |
| Latencies at this speed                                                                                                                                                                                                                                                                                                                                                                                           | 2.5-3-3-8       | 3-3-3-8                                                                                                                                                                                                                                                                                                                                                                    | 3-3-3-8               | 3-3-3-8                                                                                                                                                                                                                                                                                                                                                                                                    | 5-4-4-12            |
| Heatspreader                                                                                                                                                                                                                                                                                                                                                                                                      | No              | No                                                                                                                                                                                                                                                                                                                                                                         | No                    | No                                                                                                                                                                                                                                                                                                                                                                                                         | No                  |
| OVERCLOCKING RESULTS                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Maximum FSB                                                                                                                                                                                                                                                                                                                                                                                                       | 230MHz          | 250MHz                                                                                                                                                                                                                                                                                                                                                                     | 215MHz                | 235MHz                                                                                                                                                                                                                                                                                                                                                                                                     | 236MHz              |
| Maximum module speed                                                                                                                                                                                                                                                                                                                                                                                              | 460MHz          | 500MHz                                                                                                                                                                                                                                                                                                                                                                     | 430MHz                | 470MHz                                                                                                                                                                                                                                                                                                                                                                                                     | 629MHz              |
| Maximum processor speed                                                                                                                                                                                                                                                                                                                                                                                           | 2.3GHz          | 2.5GHz                                                                                                                                                                                                                                                                                                                                                                     | 2.15GHz               | 2.35GHz                                                                                                                                                                                                                                                                                                                                                                                                    | 2.36MHz             |
| Multitasking test (overclocked)                                                                                                                                                                                                                                                                                                                                                                                   | 161             | 172                                                                                                                                                                                                                                                                                                                                                                        | 149                   | 163                                                                                                                                                                                                                                                                                                                                                                                                        | 166                 |
| Overclock                                                                                                                                                                                                                                                                                                                                                                                                         | 15.0%           | 25.0%                                                                                                                                                                                                                                                                                                                                                                      | 7.5%                  | 17.5%                                                                                                                                                                                                                                                                                                                                                                                                      | 18.0%               |
| BUYING INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                |                 |                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Price for pair (including VAT)                                                                                                                                                                                                                                                                                                                                                                                    | £78             | £75                                                                                                                                                                                                                                                                                                                                                                        | £84                   | £82                                                                                                                                                                                                                                                                                                                                                                                                        | £66                 |
| Supplier                                                                                                                                                                                                                                                                                                                                                                                                          | www.dabs.com    | www.crucial.com/uk                                                                                                                                                                                                                                                                                                                                                         | www.pcnextday.co.uk   | www.savastore.com                                                                                                                                                                                                                                                                                                                                                                                          | www.lowestonweb.com |
| Details                                                                                                                                                                                                                                                                                                                                                                                                           | www.corsair.com | www.crucial.com/uk                                                                                                                                                                                                                                                                                                                                                         | www.elixir-memory.com | www.kingston.com                                                                                                                                                                                                                                                                                                                                                                                           | www.aenenon.com     |
| REVIEW                                                                                                                                                                                                                                                                                                                                                                                                            |                 |                                                                                                                                                                                                                                                                                                                                                                            |                       |                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Corsair's 1GB DDR kit has slightly tighter 2.5-3-3-8 latency timings than the other DDR modules in the group, and it was as quick as the Crucial DDR set in our benchmarks with an overall score of 136. We overclocked our PC by 15 per cent with this set fitted, but the Kingston and Crucial DDR kits allowed us to go higher to 17.5 and 25 per cent. Crucial's DDR kit is cheaper, faster and a better buy. |                 | At £75 for 1GB, Crucial's CT2KIT6464Z40B DDR kit is the cheapest DDR memory in the group. However, its performance in our 2D and 3D benchmarks was on a par with the other DDR modules. Better still, it's incredibly overclockable, and we managed to overclock our test PC by 25 per cent with it installed. Whether you want to overclock or not, this is our Best Buy. |                       | This 1GB DDR kit comes from Kingston's Value range of products, but it's still fast and overclockable. With this RAM fitted, our DDR test PC ran Call of Duty at 29.6fps, which was the top score in the group. Its 2D performance was also strong, and we were able to overclock the system by an impressive 17.5 per cent before it became unstable. It's good value, but Crucial's set is better still. |                     |
|                                                                                                                                                                                                                                                                                                                                |                 |                                                                                                                                                                                                                                                                                         |                       |                                                                                                                                                                                                                                                                                                                        |                     |

## OVERCLOCKING DDR2 RAM

| BEST BUY                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| MANUFACTURER                                                                                                                                                                                                                                                                                                                                                                                                                                            | A-DATA            | CORSAIR                                                                                                                                                                                                                                                                                                                                                                                                                                 | CORSAIR         | CRUCIAL                                                                                                                                                                                                                                                                                                                                                                                                                  | CRUCIAL            |
| Model                                                                                                                                                                                                                                                                                                                                                                                                                                                   | M2OAD6G3I4170IIE5 | TWIN2X1024A-6400C4                                                                                                                                                                                                                                                                                                                                                                                                                      | TWIN2X1024-8500 | BL2KIT6464AA804                                                                                                                                                                                                                                                                                                                                                                                                          | BL2KIT6464AA1005   |
| Rating                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ★★★               | ★★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                   | ★★★             | ★★                                                                                                                                                                                                                                                                                                                                                                                                                       | ★★★                |
| Module size                                                                                                                                                                                                                                                                                                                                                                                                                                             | 512MB             | 512MB                                                                                                                                                                                                                                                                                                                                                                                                                                   | 512MB           | 512MB                                                                                                                                                                                                                                                                                                                                                                                                                    | 512MB              |
| Rated speed                                                                                                                                                                                                                                                                                                                                                                                                                                             | 800MHz            | 800MHz                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1,066MHz        | 800MHz                                                                                                                                                                                                                                                                                                                                                                                                                   | 1,000MHz           |
| Rated bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                         | PC2-6400          | PC2-6400                                                                                                                                                                                                                                                                                                                                                                                                                                | PC2-8500        | PC2-6400                                                                                                                                                                                                                                                                                                                                                                                                                 | PC2-8000           |
| Latencies at this speed                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4-4-4-12          | 4-4-4-12                                                                                                                                                                                                                                                                                                                                                                                                                                | 5-5-5-15        | 4-4-4-12                                                                                                                                                                                                                                                                                                                                                                                                                 | 5-5-5-15           |
| Heatspreader                                                                                                                                                                                                                                                                                                                                                                                                                                            | Yes               | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                     | Yes             | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      | Yes                |
| OVERCLOCKING RESULTS                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |
| Maximum FSB                                                                                                                                                                                                                                                                                                                                                                                                                                             | 236MHz            | 240MHz                                                                                                                                                                                                                                                                                                                                                                                                                                  | 236MHz          | 220MHz                                                                                                                                                                                                                                                                                                                                                                                                                   | 230MHz             |
| Maximum module speed                                                                                                                                                                                                                                                                                                                                                                                                                                    | 944MHz            | 960MHz                                                                                                                                                                                                                                                                                                                                                                                                                                  | 944MHz          | 880MHz                                                                                                                                                                                                                                                                                                                                                                                                                   | 920MHz             |
| Maximum processor speed                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2.36GHz           | 2.4GHz                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2.36GHz         | 2.2GHz                                                                                                                                                                                                                                                                                                                                                                                                                   | 2.3GHz             |
| Multitasking test (overclocked)                                                                                                                                                                                                                                                                                                                                                                                                                         | 170               | 171                                                                                                                                                                                                                                                                                                                                                                                                                                     | 172             | 160                                                                                                                                                                                                                                                                                                                                                                                                                      | 166                |
| Overclock                                                                                                                                                                                                                                                                                                                                                                                                                                               | 18.0%             | 20.0%                                                                                                                                                                                                                                                                                                                                                                                                                                   | 18.0%           | 10.0%                                                                                                                                                                                                                                                                                                                                                                                                                    | 15.0%              |
| BUYING INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |
| Price for pair (including VAT)                                                                                                                                                                                                                                                                                                                                                                                                                          | £106              | £123                                                                                                                                                                                                                                                                                                                                                                                                                                    | £152            | £140                                                                                                                                                                                                                                                                                                                                                                                                                     | £161               |
| Supplier                                                                                                                                                                                                                                                                                                                                                                                                                                                | www.memoryc.com   | www.overclockers.co.uk                                                                                                                                                                                                                                                                                                                                                                                                                  | www.aria.co.uk  | www.crucial.com/uk                                                                                                                                                                                                                                                                                                                                                                                                       | www.crucial.com/uk |
| Details                                                                                                                                                                                                                                                                                                                                                                                                                                                 | www.adata.com.tw  | www.corsair.com                                                                                                                                                                                                                                                                                                                                                                                                                         | www.corsair.com | www.crucial.com/uk                                                                                                                                                                                                                                                                                                                                                                                                       | www.crucial.com/uk |
| REVIEW                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |
| The A-Data kit is by far the cheapest overclocking DDR2 in the group, and it's even slightly less expensive than Kingston's standard DDR2 kit. It has low 4-4-4-12 latencies and will overclock by 18 per cent, but its performance in our benchmarks wasn't particularly good. If you're satisfied with an 18 per cent overclock you might as well buy the standard Kingston modules, and if you want to go higher you'll need Corsair's 800MHz TwinX. |                   | Corsair makes two varieties of overclocking 800MHz DDR2 memory: one with 5-5-5-12 timings, and the 4-4-4-12 version tested here. These modules did well in all our benchmarks apart from the multitasking test, where it was nine points behind the leaders. However, we managed to overclock it by 20 per cent, giving one of the fastest overclocked scores in the same test. If you take overclocking seriously, this is a good buy. |                 | Corsair's TWIN2X1024-8500 RAM is one of two sets of modules here rated to run at 1,066MHz. Unfortunately, we couldn't get our test PC to overclock by any more than 18 per cent with this memory fitted, giving us a maximum memory speed of 944MHz. Its performance in our benchmarks was good but not spectacular enough to justify its high price. Corsair's own, cheaper 800MHz overclocking memory is better value. |                    |
|                                                                                                                                                                                                                                                                                                                                                                      |                   |                                                                                                                                                                                                                                                                                                                                                      |                 |                                                                                                                                                                                                                                                                                                                                      |                    |



| BEST BUY                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                    |                         |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-------------------------|--------------------|
| CORSAIR                                                                                                                                                                                                                                                                                                                                                                                                                                          | CRUCIAL            | CRUCIAL            | KINGSTON                | KINGSTON           |
| VS1GBKIT533D2                                                                                                                                                                                                                                                                                                                                                                                                                                    | CT2KIT6464AA53E    | CT2KIT6464AA80E    | KVR533D2N4K2/1G         | KVR800D2N5K2/1G    |
| ★★★★                                                                                                                                                                                                                                                                                                                                                                                                                                             | ★★★★               | ★★★★               | ★★★                     | ★★★★★              |
| 512MB                                                                                                                                                                                                                                                                                                                                                                                                                                            | 512MB              | 512MB              | 512MB                   | 512MB              |
| 533MHz                                                                                                                                                                                                                                                                                                                                                                                                                                           | 533MHz             | 800MHz             | 533MHz                  | 800MHz             |
| PC2 4200                                                                                                                                                                                                                                                                                                                                                                                                                                         | PC2 4200           | PC2 6400           | PC2 4200                | PC2 6400           |
| 4-4-4-12                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4-4-4-11           | 5-5-5-18           | 5-4-4-12                | 5-5-5-16           |
| No                                                                                                                                                                                                                                                                                                                                                                                                                                               | No                 | No                 | No                      | No                 |
| 236MHz                                                                                                                                                                                                                                                                                                                                                                                                                                           | 236MHz             | 236MHz             | 236MHz                  | 236MHz             |
| 629MHz                                                                                                                                                                                                                                                                                                                                                                                                                                           | 629MHz             | 944MHz             | 629MHz                  | 944MHz             |
| 2.36GHz                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2.36GHz            | 2.36GHz            | 2.36GHz                 | 2.36GHz            |
| 167                                                                                                                                                                                                                                                                                                                                                                                                                                              | 167                | 170                | 168                     | 169                |
| 18.0%                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18.0%              | 18.0%              | 18.0%                   | 18.0%              |
| £85                                                                                                                                                                                                                                                                                                                                                                                                                                              | £81                | £121               | £97                     | £108               |
| www.ebuyer.com                                                                                                                                                                                                                                                                                                                                                                                                                                   | www.crucial.com/uk | www.crucial.com/uk | www.morecomputers.co.uk | www.lambda-tek.com |
| www.corsair.com                                                                                                                                                                                                                                                                                                                                                                                                                                  | www.crucial.com/uk | www.crucial.com/uk | www.kingston.com        | www.kingston.com   |
| Corsair's 533MHz memory has slightly lower latency timings than the Aeneon and Kingston modules. Its score of 154 in the multitasking benchmark was impressive, putting it at the top of the 533MHz group. Like the other 533MHz DDR2 modules, it allowed us to overclock our test system by 18 per cent. It's good memory, but the Aeneon modules are just as fast and a lot cheaper.                                                           |                    |                    |                         |                    |
| Crucial's DDR2 533 kit is the second-cheapest in the group, and its 4-4-4-11 latency timings are the lowest of all the 533MHz RAM. Like the other 533MHz memory modules it couldn't match the 800MHz DDR2 in the video-encoding test, but at 28fps its Call of Duty 2 score was the best of the standard DDR2 kits. It's just as overclockable as the other inexpensive DDR2 RAM, but the Aeneon modules are cheaper.                            |                    |                    |                         |                    |
| While most 800MHz memory modules are designed for overclocking, we found two sets of standard memory that are designed to run at this high speed. This faster memory makes the most difference in our video-encoding test, where this Crucial 800MHz kit proved significantly faster than the 533MHz modules. Kingston's DDR 800 kit is faster still, though, and costs £13 less.                                                                |                    |                    |                         |                    |
| Kingston's KVR533D2N4K2/1G kit is the most expensive 533MHz DDR2 in the group. Its overall score of 137 in our application benchmarks puts it one point behind the Aeneon and Corsair kits, and it was nine points behind in the multitasking test with a score of 145. Despite its high price, it's no more overclockable than the other value DDR2 RAM. All the other DDR2 533 kits are better value.                                          |                    |                    |                         |                    |
| Kingston's DDR2 533 memory is expensive, but this 800MHz kit costs just £11 more and is far better value. Its overall score of 140 puts it near the top of our 2D benchmarks, and its scores in the video-encoding and multitasking tests are also impressive. This kit can overclock by up to 18 per cent, so unless you need the extra overclocking performance of Corsair's TWIN2X1024A-6400C4 this is the DDR2 to get and it's our Best Buy. |                    |                    |                         |                    |
|                |                    |                    |                         |                    |

| G.SKILL                                                                                                                                                                                                                                                                                                                                                                                                                        | KINGSTON         | KINGSTON           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|
| F2-6400PHU2-1GBHZ                                                                                                                                                                                                                                                                                                                                                                                                              | KHX8500D2K2/1G   | KHX6400D2K2/1G     |
| ★★★★                                                                                                                                                                                                                                                                                                                                                                                                                           | ★★★              | ★★                 |
| 512MB                                                                                                                                                                                                                                                                                                                                                                                                                          | 512MB            | 512MB              |
| 800MHz                                                                                                                                                                                                                                                                                                                                                                                                                         | 1,066MHz         | 800MHz             |
| PC2-6400                                                                                                                                                                                                                                                                                                                                                                                                                       | PC2-8500         | PC2-6400           |
| 5-5-5-15                                                                                                                                                                                                                                                                                                                                                                                                                       | 5-5-5-16         | 5-5-5-16           |
| Yes                                                                                                                                                                                                                                                                                                                                                                                                                            | Yes              | Yes                |
| 236MHz                                                                                                                                                                                                                                                                                                                                                                                                                         | 236MHz           | 220MHz             |
| 944MHz                                                                                                                                                                                                                                                                                                                                                                                                                         | 944MHz           | 880MHz             |
| 2.36GHz                                                                                                                                                                                                                                                                                                                                                                                                                        | 2.36GHz          | 2.2GHz             |
| 169                                                                                                                                                                                                                                                                                                                                                                                                                            | 169              | 159                |
| 18.0%                                                                                                                                                                                                                                                                                                                                                                                                                          | 18.0%            | 10.0%              |
| £121                                                                                                                                                                                                                                                                                                                                                                                                                           | £170             | £113               |
| www.memoryc.com                                                                                                                                                                                                                                                                                                                                                                                                                | www.it247.com    | www.lambda-tek.com |
| www.gskill.com                                                                                                                                                                                                                                                                                                                                                                                                                 | www.kingston.com | www.kingston.com   |
| G.Skill's black heatspreaders look great, and these modules overclocked well. We produced a stable system running at 944MHz with an 18 per cent overclock. When running at the standard 800MHz speed they produced an unusually slow score of 146 in our multitasking benchmark, but other results were acceptable. This memory isn't bad, but Corsair's 800MHz TwinX can be overclocked further and costs only a little more. |                  |                    |
| At £170 Kingston's 1,066MHz DDR2 kit is the most expensive in the group. Our benchmarks proved that it is very fast indeed, and its overall score of 141 in our application tests is one of the best here. The modules overclock well, too, and we managed to run our test PC 18 per cent faster than normal with them installed. Corsair's TWIN2X1024A-6400C4 kit is far cheaper, though, and can be overclocked further.     |                  |                    |
| Although Kingston's 1,066MHz overclocking memory is frighteningly expensive, this 800MHz kit is one of the cheapest in its class. Its score of 185 in our video-encoding test was disappointing for 800MHz overclocking memory, but its overall score of 139 is in the middle of the group. Unfortunately, we could overclock the memory by only 10 per cent, so even at this comparatively low price it's not a good buy.     |                  |                    |
|                                                                                                                                                                       |                  |                    |

Labs verdict Memory

Whether you want good-value memory to give your computer a boost or high-speed modules that you can overclock, you'll find something suitable here.

If you need DDR RAM, Crucial's CT2KIT6464Z40B is the memory to buy. It's fast, good value and can be overclocked by 25 per cent. It's our Best Buy. If you want DDR2 533MHz memory, we recommend two of Aeneon's AET660UD00-370A98Z modules. Although they're not available as a matched pair, they're cheap and fast. They win our Budget Buy award.

If your PC is compatible with DDR2 800MHz memory, you should pick from two sets of modules. If you don't want to overclock your system, or if you're an overclocker on a budget, we recommend Kingston's KVR800D2N5K2/1G kit. It's inexpensive, fast and can be overclocked by 18 per cent if you wish. It's our Best Buy for DDR2 memory. If you love to push your PC as far as possible, we recommend Corsair's TWIN2X1024A-6400C4. These modules don't cost much more, but we overclocked them until our computer's bus was running at an impressive 240MHz. For overclockers, they're our Best Buy.

|                                                                                       |                                            |
|---------------------------------------------------------------------------------------|--------------------------------------------|
|  | <b>CRUCIAL CT2KIT6464Z40B</b><br>★★★★★     |
|  | <b>AENEON AET660UD00-370A98Z</b><br>★★★★★  |
|  | <b>KINGSTON KVR800D2N5K2/1G</b><br>★★★★★   |
|  | <b>CORSAIR TWIN2X1024A-6400C4</b><br>★★★★★ |

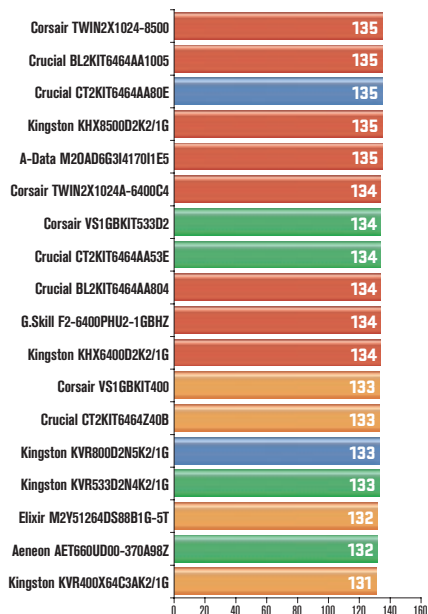
## BENCHMARKS

Standard  
DDR 400Standard  
DDR2 533Standard  
DDR2 800Overclocking  
DDR2

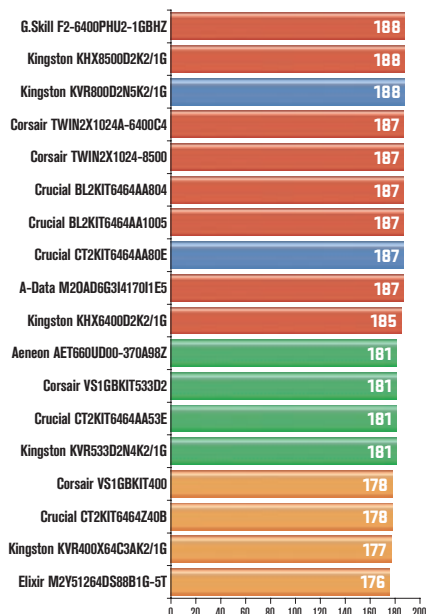
All scores are without overclocking. For overclocked performance, see the tables on pages 98 and 99

## 2D Performance Shopper application tests

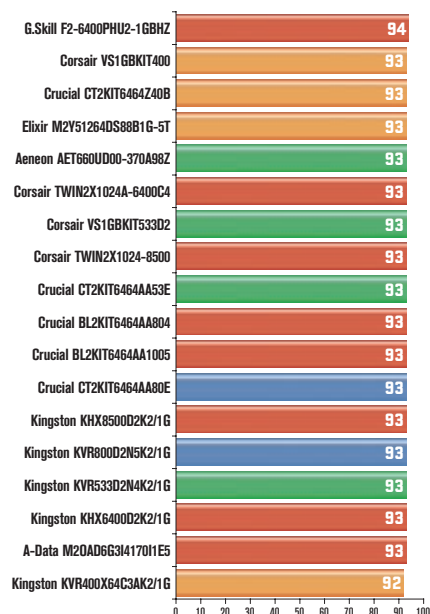
## Image-Editing



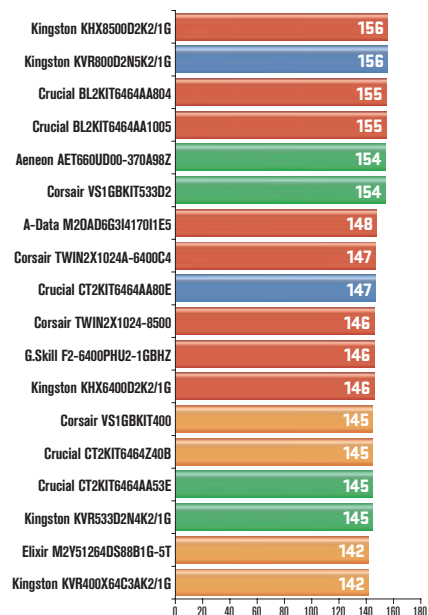
## Video-Encoding



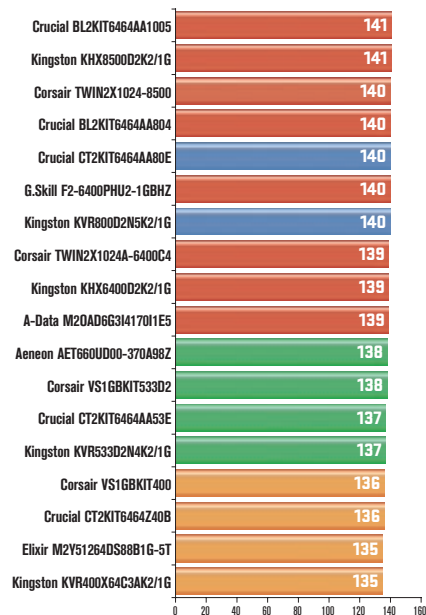
## Audio



## Multitasking



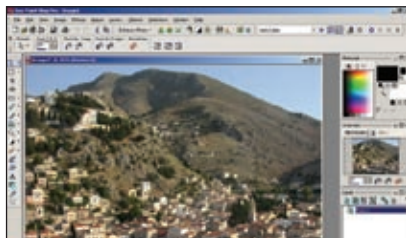
## Overall



Computer Shopper's 2D benchmarks have been designed to show how PCs stand up to the toughest tasks Windows can throw at them. Today's PCs have no problem running office applications such as Word and Excel, so we have chosen to focus our tests on areas where you could experience difficulties.

Encoding a short video to MPEG2 format is a processor-intensive task that anyone transferring home videos to DVD will have to tackle. Our image-editing test simulates a session of photo enhancement using Paint Shop Pro X. In our third test, a set of audio files is ripped to MP3 format.

Finally, we have a multitasking test designed to test the benefits of HyperThreaded and dual-core processors. This test compresses

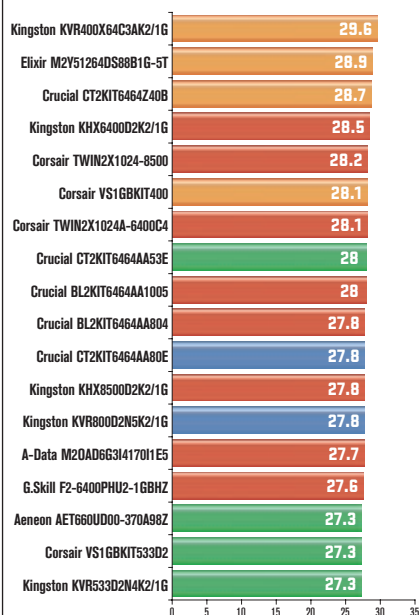


**SETTINGS** We run our application tests at 1,280x1,024 resolution and in 32-bit colour  
**WEB** [www.computershopper.co.uk](http://www.computershopper.co.uk)

a DVD at the same time as running our image-editing test. Figures are relative to a reference Evesham Athlon 64 3500+, which scores 100 in all tests.

## 3D Performance Games

## Call of Duty 2 (fps)



**SETTINGS** 1,280x1,024 resolution, 32-bit colour, default settings  
**WEB** [www.futuremark.com](http://www.futuremark.com)

Call of Duty 2 uses DirectX and is one of the most demanding games available. With a wide range of effects and frenetic action, it tests every aspect of graphics performance. The results of this test show how well memory will cope with the latest games coming on to the market at the moment